Notice of Allowability	Application No.	Applicant(s)	
	10/509,957	HA ET AL.	
	Examiner	Art Unit	
	Renata McCloud	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *01/05/2006*.

2. ☒ The allowed claim(s) is/are *1-36*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

MARLON T. FLETCHER
PRIMARY EXAMINER

DETAILED ACTION

Drawings

1. The drawings were received on 10/20/2005. These drawings are approved.

Allowable Subject Matter

2. Claims1-36 are allowed. The following is an examiner's statement of reasons for allowance:

Claims 1-19: the prior art fails to teach or make obvious a sensorless control apparatus of an AC motor which separates a motor current into a magnetic flux component and a torque component based on an estimated magnetic flux position of a synchronous motor without using position and speed sensors and independently controls the flux and torque components, thereby implementing a high control performance of the synchronous motor, comprising: a high frequency generator for superposing a high frequency signal on an estimated magnetic flux axis of the motor; a high frequency component extractor for extracting, from a voltage or current detection signal having the same frequency component as a frequency component of the high frequency signal, an error signal of the magnetic flux position which is obtained based on a magnetic saliency of a physical quantity of the motor in a high frequency region generated by a magnetic saturation caused by a main magnetic flux or a conductor skin effect produced by a high frequency; a magnetic flux observer for estimating a magnitude and a position of a magnetic flux from a motor input voltage, a detection current and a speed estimation value; a first regulator for adaptively regulating an error signal of a magnetic flux position to be an output of the high frequency component extractor; a second regulator for regulating an error signal calculated from a magnetic flux estimation value and an error value of an output of the magnetic flux observer in a same observer; a device for switching the first regulator at a very low speed,

the first and second regulators at a low speed and the second regulator at a high speed; and a speed estimator for generating a speed estimation value from an output value of the device.

Claims 20-30 The prior art fails to teach or make obvious a sensorless control apparatus of an AC motor which separates a motor current into a magnetic flux component and a torque component based on an estimated magnetic flux position of a synchronous motor without using position and speed sensors and independently controls the flux and torque components, thereby implementing a high control performance of the synchronous motor, comprising: a high frequency generator for superposing a high frequency signal on an estimated magnetic flux axis of the motor; a high frequency component extractor for extracting, from a voltage or current detection signal having the same frequency component as a frequency component of the high frequency signal, an error signal of the magnetic flux position which is obtained based on a magnetic saliency of a physical quantity of the motor in a high frequency region generated by a magnetic saturation caused by a main magnetic flux or a conductor skin effect produced by a high frequency; a magnetic flux observer for estimating a magnitude and a position of a magnetic flux from a motor input voltage, a detection current and a speed estimation value; a third regulator for adaptively regulating an error signal of a magnetic flux position to be an output of the high frequency component extractor; a fourth regulator for regulating an error signal calculated from a magnetic flux estimation value and an error value of an output of the magnetic flux observer in a same observer; a device for switching the third regulator at a very low speed, the third and fourth regulators at a low speed and the fourth regulator at a high speed; and a speed estimator for generating a speed estimation value from an output value of the device.

Clams 31-36: The prior art fails to teach or make obvious a sensorless control apparatus of an AC motor which separates a motor current into a magnetic flux component and a torque component based on an estimated magnetic flux position of a synchronous motor without using

position and speed sensors and independently controls the flux and torque components, thereby implementing a high control performance of the synchronous motor, comprising: a high frequency generator for superposing a high frequency signal on an estimated magnetic flux axis of the motor; a high frequency component extractor for extracting, from a voltage or current detection signal having the same frequency component as a frequency component of the high frequency signal, an error signal of the magnetic flux position which is obtained based on a magnetic saliency of a physical quantity of the motor in a high frequency region generated by a magnetic saturation caused by a main magnetic flux or a conductor skin effect produced by a high frequency; a magnetic flux observer for estimating a magnitude and a position of a magnetic flux from a motor input voltage, a detection current and a speed estimation value; a third regulator for adaptively regulating an error signal of a magnetic flux position to be an output of the high frequency component extractor; a fourth regulator for regulating an error signal calculated from a magnetic flux estimation value and an error value of an output of the magnetic flux observer in a same observer; a device for switching the third and fourth regulators depending on speed; and a speed estimator for generating a speed estimation value from an output value of the regulators.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renata McCloud whose telephone number is (571) 272-2069. The examiner can normally be reached on Mon.- Fri. from 8 am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Martin can be reached on (571) 272-2800 ext. 4. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Renata McCloud
Examiner
Art Unit 2837

RDM